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posed Mr. James Yates, M.A., F.R.S., and other advocates of that system, when they publicly recommended at the Society of Arts and at the Institution of Civil Engineers that we should abandon our own time-honoured system of measures, weights, and money, and adopt the revolutionary system of the French Republic, which, as I said before, I have always reprobated, having become convinced that the decimal metrical system of the French, which was professedly intended for the imitation of all mankind, was as great a failure in science as their other theories of liberty, equality, and the rights of man have been in legislation.

The new silver cent pieces proposed should be stamped with the words ONE CENT OR 10 FARTHING. The present sixpenny pieces need not be called in; but when more are required, let them be stamped with the words, ONE HALFSHILLING. In like manner, when more of the present fourpenny pieces are required, let them be stamped ONE THIRD OF A SHILLING; and when more of the present threepenny pieces are required, let them be stamped ONE FOURTH OF A SHILLING. To add anything more would be superfluous.

On the Mortality arising from Naval Operations. By WILLIAM BARWICK HODGE, Esq., Fellow of the Statistical Society and of the Institute of Actuaries.*

[Extracted from the *Journal of the Statistical Society.*]

TO ascertain with precision the loss of life occasioned by war is an object of so much importance in every point of view, whether national or social, that whatever apology may be required for the manner in which the present subject is treated, none can be necessary for bringing it forward.

That so little should have been done towards the elucidation of the question, is no doubt partly attributable to the difficulty of obtaining accurate information with respect to it, but in a greater degree, perhaps, to the reluctance to dwell upon it felt by the public.

It certainly is a painful task to endeavour, in the words of a celebrated military writer, "to sound the stream of blood in all its horrid depths"; but in this country, where every citizen may be

* The publication in which this paper first appeared is probably in the hands of some of our readers and is accessible to most others; as it was always intended, however, that this *Journal* should contain, for the most part, whatever bears upon the subject to which it is devoted, and as the paper itself is an important one, we have not hesitated to give it insertion.—ED. A. M.

called upon to influence by his vote the question of peace or war, it is clearly the duty of all to inform themselves fully of the consequences that follow the adoption of the latter alternative.

Under the influence of such a conviction it was that I entered upon the present inquiry, with a view of bringing it in some form before the Society; and it was originally my intention to comprise in one paper the principal results relating to the mortality of the military and naval services during the last great war, for which purpose I had, at some cost of labour, collected the requisite materials. Finding, however, that it was impossible to do justice to both branches of the subject in a single communication, I have been compelled in the present one to confine myself to the mortality in the navy.

From the immense number of returns upon various subjects that were annually laid before the two Houses of Parliament during the period to which I refer, it is natural to suppose that an ample store of facts relating to questions of such importance to the nation as the strength and mortality of the navy would be found in public documents; but the reverse of this is the case, and for such scanty information as we possess we are principally indebted to the industry of one or two private individuals.

The Journals of the House of Commons from 1793 to 1815, so far as I have been able to discover, contain no returns as to the *personnel* of the navy beyond the annual estimates and numbers of men voted. These, with the returns of killed and wounded, periodically published, are the only official documents to which we can refer; and even the latter, it appears, were not always given to the public.

Returns of killed and wounded, however, give but faint indications of the mortality occasioned by warlike operations, whether upon land or at sea. From the toils of the march and the exposure of the bivouac—amidst the exhalations of pestilential swamps, of crowded hospitals and ill ventilated ships—in the bosom of the ocean itself and among the rocks and shoals upon its margin, the harvest of the victims of human strife is gathered more silently and more gradually but in far greater numbers than amidst the thunders of actual conflict. In the course of the present inquiry we shall see how comparatively small a portion of the deaths occasioned by war is formed by those which occur in battle.

The only attempt, that I am acquainted with, to give a general view of the losses in action of the navy, is to be found in the volume for 1853 of a valuable and well known publication, the *Companion to the Almanack*, where, in an article entitled “Cost of

War," lists are professed to be given, chronologically arranged, of all the actions from 1793 to 1815 in which our naval and military forces were engaged, with the numbers of killed and wounded in each case. Having tested the numbers in this article, I find that those relating to the army may be relied upon for accuracy; but although those given with respect to the navy are in general correct, the statement itself is very defective, from the large number of actions omitted. The number of naval actions recorded is only 198, and the casualties stated to have happened therein 14,047; but in the table No. I., appended to this paper, I have registered the results of 576 actions, causing casualties to the amount of 19,382.

This table shows the mortality in the navy arising from battle and shipwreck in each year during the hostilities which took place in and between 1793 and 1815, and it has been derived from a careful examination of the particulars of each of the actions which occurred in the period.

The details of the killed and wounded were taken from James's *Naval History*, a work which has been pronounced by a high authority to approach as near perfection as is possible for any human production. Sir Archibald Alison declares the accuracy of the author to be inimitable, and it is certainly deserving of the highest praise. Mr. James had the opportunity of examining at the Admiralty the log books of the various ships engaged; and he has recorded the particulars of a great many actions which were never given in the *London Gazette*, and for which we should search in vain in any published official documents.

In this table an attempt has been made to estimate the number of those among the wounded who died subsequently of their wounds. The ordinary distinction between those said to have been killed, and those said to have died of wounds, is hardly accurate, because both classes might be correctly described by either form of expression; but the terms are generally received, and as they are convenient for preventing repetitions, I may perhaps be permitted to use them. It will therefore be understood that the expression "killed" refers only to those who died from injuries at the moment of receiving them, and that "died of wounds" refers to those who died of injuries subsequently to receiving them.

From there being no official returns, and very little precise information of any kind upon the subject, there is great difficulty in assigning the proportion of those who die of wounds received in naval engagements.

The only facts bearing directly upon the point that I am able

to refer to are to be found in Sir Gilbert Blane's account of the action fought in the West Indies, in the year 1782, by the fleet under the command of Sir George Rodney. The author there states that 810 men were wounded in the engagement, of whom 60 died on board the ships, and 32 were sent to the hospitals. From the small number so sent, it is most likely they were all serious cases; and the assumption that about one half of these only recovered would raise the probable deaths among the wounded to 76, or very nearly 1 in 10. This proportion is in some measure confirmed by the following:—

Return of Wounded among the Garrison at the Siege of Gibraltar, 1779-1783, taken from Colonel Drinkwater's Work.

Result.	Officers.	Non-Commissioned Officers and Rank and File.	Total.	Ratio per 1,000.
Died	1	109	110	99
Recovered—				
Discharged, disabled	3	135	138	122
Returned to duty ..	31	839	870	779
Total wounded	35	1,083	1,118	1,000

We find by this return that those who died of wounds were 99 out of 1,000 of the wounded, or as nearly as possible 1 in 10. A large portion of the injuries suffered by the garrison must, as in naval actions, have been inflicted by heavy artillery; and as the wounded possessed, with respect to shelter and attendance, the same advantages as men wounded at sea, it seems not improbable that their chances of recovery would be nearly the same. I have therefore adopted the result in which the two cases cited seem to agree, and taken 1 in 10 as the proportion of the wounded in naval engagements who die of wounds.

It is certainly to be wished that we had more extensive data upon which to found an opinion; but having given the subject very careful consideration, I am inclined to think the estimate does not vary in a material degree from the truth, as there are collateral facts which point to a result not very dissimilar. The proportion of deaths among the wounded in engagements on land, was during a considerable period of the Peninsular war 130 per 1,000, or very nearly 1 in 8; and it can hardly be doubted that, from the greater hardships to which wounded soldiers are exposed, the mortality among them must be in a greater ratio than among the wounded at sea, assuming the injuries in both cases to be equally severe.

Taking the whole of the casualties in action in the British service during the wars of the French Revolution, the proportion of those returned killed to the whole number injured in naval engagements was 100 in 398, or rather more than 1 in 4; while in engagements on land it was 100 in 529, or rather less than 1 in 5. It may perhaps be thought, that as a greater proportion of deaths were inflicted in the navy, the injuries suffered by the wounded would also be of a severer character, but this is not necessarily the case. A large proportion of the wounds in naval actions are caused by round shot; of those in actions on land, by musketry. An injury to a vital organ from a round shot would be more likely to prove fatal at once than one from a musket ball; a man mortally wounded by the latter might yet linger on for some time, a result less probable in the former case.

The following statement, showing the proportion of those severely to those slightly wounded in the navy at the attack on Sebastopol (17th October, 1854), and in several regiments at the battle of Inkerman, appears to confirm this view.

Wounded.	In the Navy.	In the Army.
Severely	328	568
Slightly	672	432
	1,000	1,000

In the attack on Sebastopol, the shipping were not very closely engaged; if it had been otherwise, the proportion of severely wounded might perhaps have been greater.

The following facts, as to the results of surgical operations, may assist us in forming a judgment upon the subject:—

Professor Simpson, of Edinburgh, has recorded the results of 2,713 cases of amputation performed in various European hospitals; out of the whole number, 1,040, being 38 per cent., terminated fatally.

It is stated by Mr. Guthrie, that 1 out of 3 of the operations in the field which came under his observation were unsuccessful. Mr. Roland Alcock, chief of the medical staff of the British auxiliary legion in Spain, found the proportion 1 in $2\frac{2}{3}$.

The deaths among the surgical cases treated in the Marylebone Infirmary were 6 in 100. (*Statistical Journal*, vol. vi., p. 309.)

In applying these results to the numbers wounded in action, it

must be borne in mind that "in the British service every wounded man, although merely scratched, reports himself to the surgeon, in order that he may get his smart money, a pecuniary allowance so named." (James, vol. vi., p. 101.)

From the facts contained in the foregoing statements, the following would appear to be the probable average result of 1,000 cases of injury received in a naval engagement:—

Killed	250
Die of wounds	75
Total deaths	325
Recover, but are disabled	95
	420
Recover fit for duty	580
Total	1,000

Notwithstanding the remark quoted from James, it is probable that in returns of killed and wounded, omissions must occasionally take place. In the table I have assumed that these omissions were equal to 2 per cent. upon the actual numbers, which gives an increase of 124 deaths.

To the casualties in action from wounds and injuries, has been added the number of those drowned or destroyed in ships sunk or burnt by the enemy; but the total being small in comparison, it did not appear necessary to state the annual losses of that kind, although it was desirable to keep them distinct from those next to be described.

In a separate column are given the numbers drowned or destroyed in each year, in ships accidentally wrecked or burnt. The mortality from this source, which it will no doubt surprise many to find double that arising from injuries received in action, was deduced from the annual lists of ships lost or destroyed, given by Mr. James in the appendices to his *History*; and reliance may be placed on the accuracy of the estimate, as one subsequently made from Mr. W. O. J. Gilly's *Shipwrecks of the Royal Navy* (London, 1850) agrees with it very nearly. This work is said to have been compiled from official documents in the Admiralty, to which the author had access; and the result deduced from it gives the number of deaths from similar causes in the same period at 13,675, or only 64 more than the number in Table I.

It may appear to some persons erroneous to attribute this class of mortality to the effects of war, seamen being, apparently, as much exposed to the risks of the seas in following their occupation

during peace. It is certain, however, that those risks are greatly increased by the services required from the navy in the time of war, and it must be obvious that a larger number become exposed to them from the additional force kept up.

For a considerable portion of the war, the navy was principally engaged in blockading the enemy's ports; and the squadrons so employed were kept at sea in seasons and during weather when, under other circumstances, they would have gone into harbour. During hostilities, too, it often happened that, in the eagerness of pursuit or the anxiety for escape, ships were placed in situations of danger which would otherwise have been carefully avoided. Indeed, it may be fairly assumed that the mortality from shipwreck among the mercantile marine was in some measure increased by the war, as it is highly probable that in tempestuous weather vessels were lost in attempting to avoid hostile ports, which in time of peace would have afforded them secure asylums.

A comparison, however, with the losses from similar causes during peace, is the best criterion of the correctness of the view adopted as regards the navy. During the war, independently of those sunk or destroyed by the enemy,

28 line-of-battle ships,
62 frigates,
251 smaller vessels;

In all, 341 sail belonging to the navy,

either foundered or were wrecked, or burnt, from accidental causes, with a loss as shown in the table of 13,621 lives, or about 666 per annum for the period considered. From Mr. Gilly's work, already quoted, it appears that from the end of 1815 to the end of 1850, a period of 35 years, the number of vessels similarly lost in the navy, all of them being of the smaller classes, was only 185, and the number of men 1,320, being 38 annually, or in the ratio of rather more than 1 for every 1,000 men employed. It is undoubted, therefore, that during the last war the risk of death to persons employed in the navy, from the accidental destruction of vessels, was four or five times greater than it has been since the peace. In reference to this fact, we must bear in mind the great improvements made since the war in the form and construction of our ships, which, with the introduction of steam-vessels into the navy, have probably tended to diminish the mortality from this cause, and, it is to be hoped, will have that effect in the present war.

If, however, we admit that the losses in this respect might, if

the country had been at peace, have reached the annual rate of 2 per 1,000, which is nearly double the average from 1815 to 1850, the total number of deaths upon a peace establishment of 40,000 men would only have amounted to 1,636, leaving 11,985 chargeable to the war.

The number of deaths being ascertained, it is necessary to compare them with the number of men liable to the accidents by which the deaths were produced. I have already said that no official returns of the number actually serving in the navy, at any period during the war, have, so far as I am able to discover, been published, nor indeed any enumeration of the numbers of men, except the annual votes in Parliament. Sir Gilbert Blane, however (*Select Dissertations*, p. 2), states that he ascertained at the Admiralty "there were on board the various British ships of war, in all parts of the world,"

On the 1st of January, 1811, 138,581	} the numbers	{	145,000	
" " 1812, 136,778			voted for those	145,000
" " 1813, 138,324			years being	140,000

In the column headed "Estimated average effective strength," it is assumed that the numbers serving in each year bore a similar proportion to the numbers voted as in the average of the three years above mentioned; but in the application of this rule it has been modified to a certain extent, as it appeared probable that in years when an increase upon the preceding year was voted, the relative deficiency was likely to be greater, and in years of diminution less, than the average, which during the whole war appears to have been 110,180 men.

It is necessary to state, however, that those naval officers whose opinions I have obtained upon the subject consider that the number of men actually employed was always greater than the number voted; and it is not improbable that the case was so, as Sir Gilbert Blane's statement refers only to men actually afloat, and some portion of the marines, who are included in the votes for the navy, are always serving on shore. The annual numbers voted are therefore given in an additional column.

In the lists of killed and wounded, the officers are distinguished from the petty officers and men. This was done in the hope of being able to determine the relative mortality of the two classes, but I have entirely failed in my endeavours to find a rule to be depended on as to the relative numbers of officers and men exposed to the contingencies of the service. Some person, however, more conversant with professional details, may perhaps be able to make

the classification available; at present we can only deal with the collective numbers.

The period during which Great Britain was engaged in hostilities, from their commencement in 1793 to their final termination in 1815, was exactly 20 years and 165 days, or $20\frac{4.5}{100}$ years. Dividing by this period the total loss shown in the table, we get the following result:—

Mortality in the Navy caused by Battle and Shipwreck during $20\frac{4.5}{100}$ Years of Hostilities in and between 1793 and 1815.

Causes of Death.	Mean Strength, 110,180.		Mean Strength, 1,000.
	Total Deaths.	Annual Ratio.	Annual Ratio.
Hostile engagements	6,663	326	3
Ships accidentally wrecked } or burnt }	13,621	666	6
Total	20,284	992	9

The present inquiry is not affected by the mortality arising from disease, except in so far as the latter may have been increased by war. At first sight there appears no reason why this should be the case. In the army we know that the disease and the mortality therefrom are both frightfully multiplied by active service; but it would seem that the sailor, when not actually engaged in combat, is not subject to any hardships in war that he is not equally liable to in peace.

An examination of such facts as we are in possession of, leads nevertheless to a directly contrary opinion.

It must be confessed that the means we have of forming a judgment are limited; and my hearers not acquainted with the fact will no doubt share the astonishment expressed by an enlightened foreigner, M. Dupin (*Force Navale de la Grande Bretagne*), on learning that it was not until the year 1810 that the English Admiralty required regular annual returns to be made to them of the deaths which took place on board the ships in the navy.

None of these returns were given officially to the world until the valuable reports upon the "Health of the Navy," presented to Parliament, were printed; but the latter commence only with the year 1830, and therefore do not assist us as to the period of the war. The numbers of the deaths for the years 1810, 1811, and 1812, were published in his *Select Dissertations* (page 2) by Sir

Gilbert Blane, to whom we are indebted for nearly all that was known upon the subject previously to the publication of the reports I have mentioned.

This able writer has given in his works three distinct statements, derived either from official documents or his own recorded observations, as to the deaths in the navy, and from these we are able to form some opinion as to the rate of mortality at the periods to which they refer.

The first in chronological order is a return to the House of Commons (*Select Dissertations*, p. 64) of all the deaths in the navy during the five years ending with 1780. They were as follows:—

Killed	1,243
Died	18,545
	<hr/>
	19,788

With a correction for those who died of wounds, this return would stand as follows:—

Killed	1,243
Estimated to have died of wounds	414
	<hr/>
Total in action	1,657
Disease and accidents	18,131
	<hr/>
	19,788

The average naval force voted for this period was 65,000 men.

The next statement shows the mortality in the British fleet upon the West Indian station, from January, 1780, to April, 1783, a period of three years and three months, during which the author filled the office of physician of the fleet. The deaths were recorded by himself, and were as follows:—

Killed and died of wounds	1,140
Drowned by shipwreck	3,000
Died from disease	3,200
	<hr/>
Total	7,340

The mean strength of this fleet was about 16,000 men.

The third statement is founded upon the returns already mentioned to have been required in 1810 to be made to the Admiralty, and gives the deaths comprised in those returns for three years, viz.:—

1810	5,183
1811	4,265
1812	4,211
	<hr/>
	13,559

The deaths in the hospitals are not included in these numbers,

which are only returns of the deaths on board the ships; but Sir Gilbert Blane assumed those in the hospitals would on the average be the same as in 1813, when they were 977, and in all other respects he supposed the numbers quoted to give the total deaths for the several years. If, however, we compare them with the corresponding entries in the column of losses by shipwreck, in Table I., we shall find the latter cannot have been included.

The deaths from shipwreck, in the year 1811, were 2,242; and if we deduct these, with the losses in action, from the total number given by our author for the same year, we shall find the mortality from disease would appear to be only 19 per 1,000, whereas for each of the years immediately preceding and following it would be 40 and 34 per 1,000 respectively. Such a variation among so large a body of men (138,000) cannot be admitted; and the conclusion therefore is inevitable, that the deaths from shipwreck are not included in Sir Gilbert Blane's numbers, and must be added to them to ascertain the total mortality.

These additions give as results for the three years (1810-1812),

Deaths on board ships	13,659
„ in hospitals (977×3)	2,931
„ by shipwreck	3,035
Total deaths	19,625

and the distribution of them was

Injuries in action	774
Shipwreck	3,035
Diseases and ordinary accidents	15,816
Total	19,625

From the foregoing three statements the following table has been drawn out, which, meagre as it is, contains, I believe, all that can now be known as to the general mortality of the navy prior to 1830:—

Table showing the Annual Ratio to 1,000 Mean Strength of the Deaths from various causes in the Royal Navy.

Causes of Death.	Whole Naval Force, 1776-1780.	West Indian Fleet, 1780-1782.	Whole Naval Force, 1810-1812.
Casualties in action	5·1	21·0	1·9
Drowned by shipwreck	55·8	54·0	7·3
Diseases and ordinary accidents }		58·0	38·3
From all causes	60·9	133·0	47·5
Mean strength	65·000	16·000	138·000

Sir Gilbert Blane estimated the total mortality from all causes in the navy, during the latter years of the war, to have been annually 1 in 30·25, or 33 per 1,000; and, assuming that one half only of the deaths on board ship were caused by disease, and the remainder by wounds and accidents, he came to the conclusion that the mortality from the former was only 1 in 42, or about 24 per 1,000 annually. In this opinion he was followed by M. Dupin, but there can be no doubt it was erroneous.*

To facilitate the comparison between the periods of war and peace, the following table has been deduced from the reports on the health of the navy, printed by order of the House of Commons, already referred to. It contains the results of all the reports yet published, with the exception of those for the East Indian station from 1840 to 1843: they are omitted on account of the Chinese war, which commenced in 1840.

Table showing the Annual Ratio to 1,000 Mean Strength of the Deaths in the Royal Navy (1830 to 1843).

Station.	1830 to 1836 inclusive.				1837 to 1843 inclusive.					
	Mean Strength.	Causes of Death.		From all Causes.	Mean Strength.	Causes of Death.				From all Causes.
		Wounds, Injuries, and Accidents.	Diseases.			Diseases.	Wounds, Injuries, and Accidents.	Drowned.	Un-known.	
South American	2,465	1·2	7·7	8·9	2,721	6·75	0·83	1·95	0·47	10·00
North American and West Indian.....	3,362	1·5	18·1	19·6	3,645	19·20	1·57	2·57	0·82	24·16
Mediterranean..	7,958	1·8	9·3	11·1	9,936	10·59	1·91	1·03	0·77	14·30
Cape of Good Hope and West Coast of Africa....	1,513	2·7	22·5	25·2	..	Return not published.				
East Indian* ..	1,849	2·2	15·1	17·3	1,883	14·34	2·48	4·42	0·53	21·77
Various commands.....	2,321	3·5	10·3	13·8	..	Return not published.				
Home	3,070	1·9	8·8	10·7	..	Return not published.				
Average....	22,538	2·0	11·8	13·8	18,185	11·93	1·70	1·68	0·72	16·03

* The deaths in the East Indian command are only taken to the end of 1839, on account of the Chinese war.

This table shows the mortality in the navy during peace, for two periods of seven years each, in the first of which returns for the whole navy are given; while in the second those for the “home” and “various” commands, and that for the Cape of Good Hope and west coast of Africa, which are not yet published, are wanting.

* It may, perhaps, excite surprise that so little reference has been made in this paper to M. Dupin’s admirable work, which contains such valuable information respecting the British navy; but as regards the mortality of that force, M. Dupin admits that his facts were all derived from the works of Sir Gilbert Blane.

The average mortality for the whole navy, during the first period (1830–1836), was 13·8 or nearly 14 per 1,000 annually; and for the second period (1837–1843), for the stations from which returns have been made, 16·03 per 1,000. As it is not probable that the returns still to be received will increase the average mortality of the second period, it appears pretty certain that the mortality throughout the navy, during peace, does not exceed 16 per 1,000 annually, and I have therefore taken it at that ratio.

Considerable difference of opinion will probably exist as to how far the returns for 1810, 1811, and 1812 are to be taken as representing the general average of mortality from disease and ordinary accidents throughout the war; and likewise as to whether we are justified in assuming that, if the country had continued at peace from 1793 to 1815, the mortality from those causes would have been the same as it was from 1830 to 1843.

Upon the former point it may be useful to remark, that the mortality from disease among so large a body of men, generally employed in nearly similar proportions in various parts of the world, would not be likely to fluctuate very considerably, although the mortality from such causes as battle and shipwreck would naturally vary according to the services in which the men were engaged, and, as we see, did vary very much from year to year.

The condition of the seamen was greatly ameliorated in the early part of the war, after the mutinies into which they were driven by the system of injustice and oppression that then prevailed. Sir Gilbert Blane appears to have considered that the improvements affecting the health of the men had been generally adopted before 1810; if this were the case, there existed no reason, except their being engaged in warlike operations, why the mortality from disease among them should have been greater than from 1830 to 1843.

If the returns for 1810, 1811, and 1812 are to be relied on, they show that the mortality from disease and ordinary accidents during the war was annually $(38·3 - 16 =) 22·3$ per 1,000, or about 140 per cent. greater than in peace.

This will, no doubt, be to many rather a startling result; and I might have hesitated as to adopting it, if it were not confirmed in a very remarkable manner by the experience of the squadron on the East Indian station, during the war with China. By the following table, deduced from one of the reports (ordered by the House of Commons to be printed on the 1st June, 1853), it appears not only that the mortality upon that station was more

than doubled by the Chinese war, but that the principal increase was in the deaths caused by disease.

The mortality from the latter source for the ten preceding years had averaged very nearly 15 per 1,000 annually; but during the war it rose to 36·78 per 1,000, being an increase of 21·78 per 1,000, or about 140 per cent.

Table showing the Mortality in the Navy on the East Indian Station for Fourteen Years ending with 1843.

	Mean Strength.	Annual Ratio to 1,000 Mean Strength of the Deaths arising from				
		Diseases.	Wounds and Injuries.	Accidental Drowning.	Unknown Causes.	All Causes.
Peace { 1830 to 1836	1,849	15·10	2·20			17·30
	1,883	14·34	2·48	4·42	0·53	21·77
War 1840, 1841, 1842	5,156	36·78	3·49	4·01	5·95	50·23

The accuracy of this table cannot be called in question; and combining its results with those already given, it seems a fair and moderate estimate that the loss of life in the navy from diseases and ordinary accidents was doubled during the revolutionary war, and that the increased mortality from those causes amounted to 16 per 1,000 annually, which, upon a force averaging 110·180 men, would give 36,051 for the total number of additional deaths during a period of $20\frac{4}{10}\frac{5}{10}$ years.

This calculation, however, assumes that the whole of the average force of 110·180 men would, had there been no war, have suffered the same rate of mortality as seamen in the navy during peace; and it is necessary, therefore, to examine whether this would have been the case. The peace establishment of the navy for the period would certainly not have exceeded an average of 40,000 men, as the number voted for 1816, the year of the expedition to Algiers, was only 33,000: the difference, therefore, between 110·180 and 40,000 or 70·180 men were annually exposed to the increased mortality of naval as compared with civil life, not included in the foregoing estimate, which only compares the mortality among seamen during peace with that among seamen during war.

It may indeed be said that the men referred to, if not engaged in the navy, would have been following the maritime profession and exposed to its risks in the merchant service: but this can hardly be admitted, as the trade of the country was carried on, by some

means, during the war; and the demand for the extra hands required, except indeed so far it was met by the employment of foreign sailors, must have been, directly or indirectly, supplied from among civilians.

In reference to this part of the question, therefore, it is necessary to compare the mortality of seamen with that among men of similar ages in civil life. In one of the Reports already so frequently mentioned (that ordered by the House of Commons to be printed, 5th October, 1841), it is stated that the ages of the persons employed in the navy vary from 15 to 50, but that the greater proportion are between 20 and 40 years of age; the average age must therefore be less than 30. It appears by Mr. Farr's English Life Table (*Registrar-General's Report for 1844*) that the mortality among the whole male population between the ages of 29 and 30 is 10 per 1,000 annually, and if we are correct in assuming 16 per 1,000 as the peace mortality in the navy, the additional deaths among civilians converted into seamen would be at least 6 per 1,000 annually; to this additional mortality, beyond that before referred to, the increased force of 70,180 men required by the war were subjected, and the number of deaths thereby caused, calculated upon the principle already laid down, was . . . 8,611

Adding to this the number before given . . . 36,051

We get an aggregate of . . . 44,662

as the total number of additional deaths arising from disease and ordinary accidents caused by the war.

In order that there may be no misconception as to the mode in which this number is obtained, it is advisable to state the calculation in another form, thus :

Total mortality from disease and ordinary accidents, at the rate of 32 per 1,000 per annum for $20\frac{4}{10}$ years, on an average force of 110,180 men 72,102

From which are to be deducted—

1. The mortality upon a peace establishment of 40,000 men for the same period, at the rate of 16 per 1,000 per annum 13,088

2. The mortality among 70,180 civilians for the same period, at the rate of 10 per 1,000 per annum 14,352

27,440

Leaving, as before 44,662

From the various estimates that have been considered, the following has been drawn out as the

General Summary of the Mortality in the Royal Navy, among an average force of 110,180 Men, during $20\frac{4.5}{10.0}$ Years of Hostilities, occurring in and between 1793 and 1815.

Causes of Death.	Number of Deaths.		Estimated Number of Deaths that would have occurred from the same causes during Peace.	Excess caused by War.	
	Annual Ratio to 1,000 Mean Strength.	Total.		Total.	Proportion to 100,000 Deaths.
Casualties in action	3	6,663	..	6,663	10.524
Drowned or destroyed in ships accidentally wrecked or burnt }	6	13,621	1,636	11,985	18.931
Estimated to have died from disease or ordi- nary accidents on board }	32	72,102	27,440	44,662	70.545
Total	41	92,386	29,076	63,310	100.000

With reference to every description of armed force, it is of the greatest importance to ascertain what is the average proportion of men unable to attend to their duty from sickness. We have no information of this kind as to the navy.

Sir Gilbert Blane gives the numbers admitted into the hospitals for several years, but he neither affords any information as to the duration of sickness among the patients, nor as to the number sick on board the ships. The statistical reports as to the health of the navy, so valuable in almost every other respect, are also defective in this.

From the Reports for the seven years ending with 1836, we learn that out of an average force of 22,538 men, 30,039 cases of sickness or of injury occurred annually, being in the ratio of 1332.8 to 1,000 of the mean strength; so that, on the average, every man was on the sick list once in nine months. As, however, no information is given as to the average time the cases were under treatment, we are unable to form any estimate of the numbers permanently sick.

Having determined, with as much precision as the materials in our possession permit, the total loss of life in the navy during the war, we will now proceed to consider the relative losses arising from the different species of service in which it was employed.

The three tables numbered II., III., and IV. (pp. 274–277), show the relative force and the loss in killed and wounded;

In actions between fleets and squadrons (No. II.);

In naval attacks upon land fortifications (No. III.);

In actions between single ships (No. IV.)

The two former tables contain the particulars of nearly every important engagement of the respective classes that has occurred in the British navy during the last 70 years, the battle of Navarino being the only material exception; but with regard to the table (No. IV.) of "Actions between Single Ships," I have only thought it necessary to select a sufficient number of cases to give a just idea of the losses to which such actions give rise. They are registered in three subdivisions:—1. Actions in which the enemy's vessel was captured. 2. Indecisive actions. 3. Actions in which the British vessel was captured.

The following is a general summary of the naval actions comprised in Tables II., III., and IV. :—

	Fleets and Squadrons.	Attacks on Land Defences.	Actions between Single Ships.			
			Enemy's Vessels Captured.	Indecisive.	British Vessels Captured.	All Classes.
Number of actions	13	10	18	6	11	35
Deaths in action, including $\frac{1}{10}$ of wounded . . }	2,335	1,028	252	108	246	606
Deaths to 1,000 mean strength }	21	21	50	79	119	71
Casualties to { Average . .	65	65	140	208	346	231
1,000 mean { Highest . .	212	147	271	470	674	674
strength { Lowest . .	19	7	4	67	180	4

The table No. I. shows the number of deaths resulting from 576 actions to have been 6,663, or $11\frac{6}{10}$ to each action. The foregoing summary refers to 58 actions, producing 3,969 deaths; but 4 of them, causing 620 deaths, are not included in table No I. Deducting these, the summary shows the results of 54 actions, producing 3,349 deaths, or 62 to each, leaving 522 actions in which there were 3,314 deaths, or $6\frac{2}{10}$ to each. It is clear therefore that the three tables comprise a very large proportion of the important operations in which the navy was engaged between 1793 and 1815.

In these tables I have gone somewhat beyond the immediate object of this inquiry, thinking that the additional information as to the elements of success or failure in naval actions might not be without its utility. In addition to the force in ships and men, the number of guns, and broadside weight of metal, are specified.

Columns are also inserted showing the proportion of loss in killed and wounded to each 1,000 men engaged; and likewise the proportion of similar losses inflicted by the same number of men upon their opponents. These particulars are given not only with respect to the British force, but likewise, in all cases where the

information could be accurately obtained, with respect to that of the enemy; the number of vessels taken or destroyed in each action is also stated, and from the results may be drawn conclusions of some interest in reference to naval affairs.

The following statement, taken from the facts in table No. II. ("Fleets and Squadrons"), shows that the loss inflicted upon us in our contests with the navies of different nations has been generally in proportion to the reputation of their seamen for skill and discipline, and is an additional proof of the importance of maintaining our superiority in those respects.

Action.	Enemy's Fleet.	Proportion of British-Loss in Killed and Wounded.			Number of Enemy's Ships.	
		To 1,000 British engaged.	To 1,000 of the Enemy engaged.	To each Ship taken or destroyed.	Engaged.	Taken or destroyed.
Cape St. Vincent	Spanish	32	19	75	25	4
Trafalgar	Franco-Spanish	100	78	94	33	18
Nile	French	112	91	82	13	11
Camperdown ..	Dutch	100	115	92	16	9

The loss sustained in an action is the price of the result obtained by it, and we must compare these elements with each other before we can arrive at a correct estimate as to either. By the above statement it is shown that the casualties of the British in the battle off Cape St. Vincent were only 32 per 1,000 engaged, while each of the enemy's ships taken or destroyed cost 75 men in killed and wounded. At the battle of the Nile each ship taken or destroyed cost only 7 more, or 82 men in killed and wounded, although the proportion per 1,000 engaged was 112, or between 3 and 4 times as many as at Cape St. Vincent. From the general result of table No. II. it appears, that out of 204 hostile vessels engaged, 73 were taken or destroyed by the British, whose total loss, in killed and wounded, was 7,349, or a fraction over 100 for each vessel lost to the enemy.

To the table No. III., headed "Naval Attacks upon Land Defences," it may perhaps be objected that the attacking fleets were in many of the cases opposed by ships of war as well as by land fortifications, which is certainly true. The defensive vessels, however, are rather to be considered as floating batteries, for, being permanently moored, they did not possess the power of movement which is the essential characteristic of a ship in an ordinary naval action. The table itself is of some interest at the present moment, when the relative power of a naval force under such circumstances is so much discussed.

The highest ratio of loss in any attack made by large fleets will be found in Lord Exmouth's bombardment of Algiers, where the casualties reached 147 per 1,000; but it must be mentioned the historian James asserts that, in the official returns relating to the attack upon Copenhagen, the slightly wounded were not included, and that the total number of casualties was 1,200. I have not thought it right to vary the numbers given in the official returns, but if the historian's statement be admitted, the total loss in that action must have been at the rate of 150 per 1,000, which would be greater than at Algiers. There is great difficulty in ascertaining with accuracy the losses suffered in these engagements by the garrisons attacked, but we have precise information upon that point with respect to the bombardment of Gibraltar, which took place in 1782. I have appended to the statement the particulars of the attacking force on that occasion, when, as is well known, the whole of the battering ships were destroyed, with a loss of nearly 1,000 men, which would probably have been very much greater, had not the assailants been so near their own coast; and although the ships were assisted by land batteries mounting 186 guns, part of which enfiladed the front attacked, the total loss of the garrison, consisting of 7,100 men, was only 84 in killed and wounded, being in the ratio of 11·8 per 1,000 engaged. An analysis of the facts relating to attacks of this description will show that against a skilful and resolute enemy they are very hazardous operations.

An additional column has been given in Table IV. ("Actions between Single Ships") to show the duration of each engagement. In reference to this point it is remarkable that the greatest ratio of loss suffered by the British, in any of the successful actions recorded, was in that which was the shortest. The engagement between the Shannon and Chesapeake lasted only 15 minutes, and in that time the British lost, in killed and wounded, 83 men, being in the proportion of 271 per 1,000 engaged.

Before concluding this paper, I would venture to suggest that the statistical reports as to the health of the navy, to which I have referred, might in some respects be improved. The deficiency as to the number permanently sick has already been noticed, and an alteration in this respect would be an advantage. It would likewise be desirable that the cases of death from wounds and injuries should be so classified as to show the numbers that die from injuries received in action, and that it should be stated whether the cases of accidental drowning arise from shipwreck or otherwise.

TABLE I.—*Showing the Mortality in the Royal Navy arising from Battle or Shipwreck during the Hostilities which occurred in and between 1793 and 1815.*

YEAR.	Number of Men Voted.	Estimated Average Effective Strength, Officers and Men.	Number of Actions.	Killed.		Wounded.		Total Casualties in Action.	Drowned or Destroyed in Ships Accidentally Wrecked or Burnt.
				Officers.	Petty Officers and Men.	Officers.	Petty Officers and Men.		
1793 ..	45,000	43,000	14	10	85	17	330	442	7
1794 ..	85,000	80,000	13	19	349	47	1,072	1,487	514
1795 ..	100,000	94,000	17	7	138	18	561	724	30
1796 ..	110,000	105,000	21	3	75	13	250	341	1,219
1797 ..	120,000	114,000	22	23	371	67	1,038	1,459	829
1798 ..	120,000	115,000	21	29	337	64	1,017	1,447	311
1799 ..	120,000	115,000	28	11	88	20	275	354	810
1800 ..	111,666	107,000	20	3	61	28	258	350	637
1801 ..	131,500	127,000	27	45	528	111	1,467	2,151	718
1802 (Peace) ..	80,000	80,000	22	1	27	8	78	114	118
1803 ..	100,000	97,000	27	15	58	46	308	467	598
1804 ..	120,000	115,000	27	27	593	83	1,703	2,406	358
1805 ..	120,000	115,000	29	11	157	47	532	747	892
1806 ..	120,000	124,000	25	9	118	30	435	593	1,840
1807 ..	129,230	124,000	46	22	148	47	528	745	528
1808 ..	130,000	125,000	36	23	150	50	587	810	347
1809 ..	130,000	125,000	45	11	262	55	656	987	749
1810 ..	145,000	137,000	27	11	147	45	533	736	406
1811 ..	145,000	137,000	27	10	187	39	523	736	2,242
1812 ..	145,000	137,000	46	23	209	45	584	861	387
1813 ..	145,000	138,000	22	23	209	39	584	861	140
1814 ..	115,000	111,000	22	1	275	50	755	1,109	352
1815 ..	85,000	81,000	4	1	38	5	84	128	204
Average ..	..	110,180	576	346	4,441	935	13,335	19,057	13,621
Total ..	..	..	..	4,789	4,441	14,270	13,335	325	19,382
Estimated deaths amongst the wounded—10 per cent.									
Estimated omissions—2 per cent.									
Drowned in action ..									
Total deaths caused by the enemy ..									
Drowned or destroyed in ships accidentally wrecked or burnt ..									
Total deaths arising from battle or shipwreck ..									

TABLE II.—Actions between Fleets or Squadrons.

No.	Date.	Action in or near.	BRITISH.										ENEMY'S.									
			Commander.	Number of Ships.	Broadside.		Number of Men Engaged.	Loss.			Ships Lost.	Nation.	Number of Ships.	Broadside.		Number of Men Engaged.	Loss Killed and Wounded.	Loss which 1,000 Men		Ships Lost.		
					Guns.	Lbs.		Killed.	Wounded.	Total.				Inflicted.	Sustained.			Inflicted.	Sustained.			
1	12 April, 1782	West Indies ..	Lord Rodney ..	36	1,315	26,781	21,608	250	810	1,060	49	*	French ..	30	1,169	31,177	*	*	*	5		
2	1 June, 1794	English Channel	Lord Howe ..	26	1,087	22,976	17,241	290	858	1,148	67	290	Do. ..	26	1,090	27,684	19,769	5,000	253	58	7	
3	14 Mar., 1795	Genoa	Admiral Hotham	14	557	12,711	8,810	71	266	337	38	68	Do. ..	13	490	12,307	9,520	600	63	36	2	
4	14 Feb., 1797	Cape St. Vincent	Lord St. Vincent	15	620	13,105	9,508	73	227	300	32	105	Spanish ..	25	1,070	19,986	15,903	1,000	63	19	4	
5	11 Oct., 1797	Camperdown ..	Lord Duncan ..	16	575	11,510	8,221	203	622	825	100	141	Dutch ..	16	577	9,857	7,157	1,160	162	115	9	
6	1 Aug., 1798	Nile	Lord Nelson ..	14	507	11,332	7,985	218	678	896	112	376	French ..	13	545	13,887	9,928	3,000	305	91	11	
7	12 July, 1801	Algebras .. .	Sir J. Saumarez	5	188	*	3,100	18	102	120	39	568	Franco- Spanish	9	391	*	7,360	1,762	240	16	3	
8	22 July, 1805	Cape Finisterre	Sir Robt. Calder	15	596	15,843	10,500	39	159	198	19	45	Do. ..	20	774	19,233	13,942	476	34	14	2	
9	21 Oct., 1805	Trafalgar .. .	Lord Nelson ..	27	1,074	29,092	16,826	449	1,241	1,690	100	*	Do. ..	33	1,313	30,472	21,565	*	*	78	18	
10	4 Nov., 1805	Bay of Biscay ..	Sir R. Strachan	9	262	6,907	4,186	24	111	135	32	174	French ..	4	161	4,503	2,852	730	256	47	4	
11	6 Feb., 1806	St. Domingo ..	Sir J. Duckworth	7	257	6,710	4,094	74	264	338	82	225	Do. ..	5	226	6,355	4,240	1,510	238	79	5	
12	12 Mar., 1811	Lissa	Sir William Hoste	4	59	966	886	44	144	188	212	*	Franco- Italian }	7	112	*	2,500	*	*	75	2	
13	20 May, 1811	Madagascar ..	Capt. Schomberg	4	73	1,518	903	25	89	114	127	185	French ..	3	66	1,389	1,130	167	147	101	1	
			Total					1,778	5,571	7,349								15,405			73	
			Average																168		54	

* Numbers not ascertained.

TABLE III.—*Naval Attacks on Land Defences.*

No.	Date.	Place Attacked.	British Commander.	Force.		Men Engaged.	Loss.				Number of Enemy's Guns.	
				Ships.	Broadside Guns.		Killed.	Wounded.	Total.	Per 1,000 Engaged.		Ships.
1	24 July, 1797	*Teneriffe	Lord Nelson	8	189	2,885	141	105	246	85	1	40
2	2 April, 1801	Copenhagen	Lord Nelson	28	700	7,978	254	689	943	118	..	628
3	6 July, 1801	*Algeiras	Sir J. Saumarez . . .	6	225	3,694	121	240	361	98	1	+
4	15 Aug., 1801	*Boulogne	Lord Nelson	+	..	+	44	126	170	+	..	+
5	July, 1806	Cape Licora	Sir Sidney Smith	3	72	1,177	6	30	36	30	..	2
6	3 Mar., 1807	Dardanelles	Sir J. Duckworth	11	324	5,077	29	139	168	33	..	+
7	5 Sept., 1814	In the River Potomac	Capt. Gordon	7	49	841	7	35	42	50	..	11
8	27 Aug., 1816	Algiers	Lord Exmouth . . .	19	348	5,558	128	690	818	147	..	425
9	6 Oct., 1840	St. Jean d'Acre	Sir R. Stopford . . .	21	437	8,000	18	42	60	7	..	103
10	17 Oct., 1854	*Sebastopol	Admiral Dundas . . .	21	571	10,700	44	266	310	29	..	1,200
			Total . . . . .	..	..	..	792	2,362	3,154	..		
			Average . . . . .	..	..	..	..	..	..	65		
	13 Sept., 1782	{ *Bombardment of } { Gibraltar }	{ By Spanish bat- } { tery ships . . . }	10	142	5,200	Estimated at		850	170	10	96

+ Numbers not ascertained.

* Unsuccessful actions.

TABLE IV.—*Actions*

ACTION.			BRITISH.								
No.	Date of.	Duration of.	Ship.	Broadside.		Number of Men engaged.	Loss.			Loss which 1,000 Men	
				Guns.	Lbs.		Killed.	Wounded.	Total.	Sus-tained.	In-flicted.
1	19 June, 1791	h. m.									
2	Oct., 1793	0 50	Nymphæ	20	322	240	23	27	50	208	263
3	17 June, 1794	2 10	Crescent	18	315	257	..	1	1	4	315
4	5 Jan., 1795	1 10	Romney	25	414	266	8	30	38	143	594
5	5 Jan., 1795	5 0	Blanche	19	228	198	8	21	29	146	940
6	13 June, 1796	0 45	Dryad	22	407	254	2	7	9	35	295
7	26 Dec., 1797	1 35	Phœbe	22	407	261	3	10	13	50	287
8	21 April, 1798	1 15	Mars	41	984	634	30	60	90	142	458
9	20 Oct., 1798	3 30	Fisgard	23	425	284	10	26	36	127	405
9	29 June, 1799	2 30	Sibylle	24	503	371	5	17	22	59	391
10	20 Aug., 1800	3 0	Seine	24	434	281	13	29	42	149	374
11	19 Feb., 1801	1 30	Phœbe	22	407	239	1	12	13	54	1,435
12	10 Aug., 1805	3 30	Phoenix	21	444	245	12	28	40	163	289
13	10 Nov., 1808	3 20	Amethyst	21	467	261	19	51	70	268	908
14	5 July, 1809	6 50	Bonne Citoyenne	10	297	127	1	5	6	47	567
15	16 Feb., 1812	4 30	Victorious	41	1,060	506	27	99	126	249	790
16	1 June, 1813	0 15	Shannon	25	538	306	24	59	83	271	477
17	12 Aug., 1813	0 45	Pelican	9	262	101	2	5	7	69	237
18	26 Mar., 1814	2 15	Hebrus	21	467	284	13	25	38	134	398
Total .....			....	..	..	..	201	512	713	..	..
Average ..			....	..	..	..	..	..	..	140	527
19	13 May, 1793	1 30	Iris	16	186	217	5	31	36	166	244
20	13 Nov., 1800	2 0	Millbrook	8	144	47	..	12	12	255	1,426
21	11 April, 1804	3 30	Wilhelmina ..	11	134	149	..	10	10	67	289
22	7 Feb., 1813	3 35	Amelia	24	549	300	51	90	141	470	350
23	25 Feb., 1814	2 10	Eurotus	23	601	329	21	39	60	182	274
24	15 Jan., 1815	5 58	Endymion ..	24	664	319	11	14	25	78	329
Total .....			....	..	..	..	88	196	284	..	..
Average ..			....	..	..	..	..	..	..	208	340
25	18 Aug., 1798	6 0	Leander	26	432	282	35	57	92	326	1,022
26	14 Dec., 1798	*	Ambuscade ..	20	288	190	10	36	46	242	368
27	16 Feb., 1805	3 0	Cleopatra ..	19	282	200	22	36	58	290	175
28	30 Oct., 1808	1 30	Carnation ..	9	262	117	10	30	40	342	*
29	26 May, 1811	*	Alacrity	9	262	100	5	13	18	180	190
30	19 Aug., 1812	1 55	Guerrière ..	24	517	244	15	63	78	320	82
31	17 Sept., 1812	0 43	Frolic	9	262	92	15	47	62	674	174
32	25 Oct., 1812	2 40	Macedonian ..	24	528	254	31	64	95	374	24
33	20 Dec., 1812	3 0	Java	24	517	379	22	102	124	379	90
34	14 Feb., 1813	0 25	Peacock	9	192	110	4	33	37	336	45
35	27 Aug., 1814	0 45	Reindeer ..	9	198	98	25	41	66	673	265
Total .....			....	..	..	..	194	522	716	..	..
Average ..			....	..	..	..	..	..	..	346	266
Total of the } three classes }			....	..	..	..	483	1,230	1,713	..	..
Average of } the three classes .. }			....	..	..	..	..	..	..	231	378

* Numbers not ascertained.

between Single Ships.

ENEMY'S.									RESULT.
Nation.	Ship.	Broadside.		Number of Men engaged.	Loss.	Loss which 1,000 Men			
		Guns.	Lbs.		Killed and Wounded.	Sus-tained.	In-flicted.		
French	Cléopâtre	20	286	320	63	197	156	Enemy's Vessel Captured.	
Do.	Réunion	20	310	300	81	270	3		
Do.	Sibylle	23	380	380	158	416	100		
Do.	Pique	19	273	273	186	681	106		
Do.	Proserpine	21	366	346	75	217	26		
Do.	Néréide	18	268	330	75	227	39		
Do.	Hercule	39	985	680	290	426	133		
Do.	Immortalité	21	450	330	115	348	109		
Do.	Forte... ..	26	604	370	145	392	59		
Do.	Vengeance	26	498	326	105	322	129		
Do.	Africaine	22	306	715	343	480	18		
Do.	Didon	23	563	330	71	215	121		
Do.	Thétis	22	524	436	237	544	160		
Do.	Furieuse	10	279	200	72	360	30		
Do.	Rivoli	40	1,085	810	400	494	156		
United States ..	Chesapeake	25	590	376	146	389	221		
Do.	Argus	10	228	122	24	197	57		
French	Etoile	22	463	315	113	359	121		
....	....	..	..	..	2,699		
....	....	..	..	..	..	388	102
French	Citoyenne Française	16	180	250	53	212	144		
Do.	Bellone	15	204	220	67	305	55		
Do.	Psyché	18	240	250	43	172	40		
Do.	Aréthuse	22	463	340	105	309	415		
Do.	Clorinde	22	463	344	90	262	174		
United States ..	President	28	852	465	105	226	54		
....	....	..	..	..	463		
....	....	..	..	..	..	247	151
French	Généreux	40	1,024	936	288	308	98		
Do.	Baionnaise	10	150	280	70	250	164		
Do.	Ville de Milan	23	350	350	35	100	166		
Do.	Palinure	8	174	100	*	*	400		
Do.	Abeille	10	260	130	19	146	138		
United States ..	Constitution	28	768	460	20	43	170		
Do.	Wasp	9	268	135	16	119	459		
Do.	United States	28	864	474	6	13	200		
Do.	Constitution	28	768	480	34	71	258		
Do.	Hornet	10	297	162	5	31	228		
Do.	Wasp	11	338	173	26	150	381		
....	....	..	..	..	519		
....	....	..	..	..	..	145	194
....	....	..	..	..	3,681		
....	....	..	..	..	..	260	149

* Numbers not ascertained.